150 YEARS OF CELEBRATING THE MAHATMA

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सत्यमेव जयते

स्वच्छ भारत
एक कदम स्वच्छता की ओर

भारत सरकार
आवासन और शहरी कार्य मंत्रालय
निर्माण भवन, नई दिल्ली-110011
GOVERNMENT OF INDIA
MINISTRY OF HOUSING & URBAN AFFAIRS
NIRMAN BHAWAN, NEW DELHI-110011

नई दिल्ली-110011, तारीख 20
New Delhi-110011, Dated the 20

D.O. Letter No. K-15016/62/2015-SC-I

Dated 3rd February, 2020

Dear CEOs,

As you are aware, this Ministry has announced the individual City readiness report of the first phase of "ClimateSMART Cities Assessment Framework" during the 3rd APEX Conference of Smart Cities Mission held at Vishakhapatnam on January 24-25, 2020. The cities can view their scores, performance report and recommendations for further improvement on the SmartNet portal at https://smartnet.niua.org/csc/.

2. The just concluded first phase of the assessment framework does not intend to rank the cities but to help them understand their status regarding climate mitigation and adaptation. Cities would need to learn from each other's experience, form a climate alliance and work towards combating climate change impacts collectively. The success stories, best practices, advisories and other reference materialsare available in the knowledge repository section on the micro-site on SmartNet.

3. This assessment framework is proposed to be continued for a consistent effort for making the cities vibrant, climate resilient and sustainable. Smart City SPVs, through this assessment framework, is envisaged to make continuous efforts to steer the city, in coordination with respective State/UT departments, on various climate resilient actions. In this context, the phase-II of this framework is tentatively scheduled as below:

Process	Timelines
Announcing the Phase-II (Opening the portal for Data Submission)	1st March- 30 April, 2020
Data Validation, Review by Expert Committee and Preparation of City Wise Performance Reports	1st May- 30 September, 2020
Result Announcement	October, 2020

4. The revised draft indicators for phase-II of the assessmentare enclosed, which are also available on the SmartNet portal at **https://smartnet.niua.org/csc/**. These indicators have been revised after a detailed consultative process undertakenby the Expert Committee based on the experiences of the first assessment. You are requested to furnish your suggestions and commentsto further improve these indicators, if any,to Mr. Lal Chhandama, Director (SC-I) by **15thFebruary, 2020**at lal.chhandama@gov.in.

Yours Sincerely

(Kunal Kumar)

Encl: as above

To,
100 CEOs of Smart Cities
Copy to: Principal Secretaries (UD) and State Mission Directors (SCM)

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On behalf of Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of the Federal Republic of Germany

Ministry of Housing and Urban Affairs
Government of India

150 YEARS OF CELEBRATING THE MAHATMA

स्वच्छ भारत एक कदम स्वच्छता की ओर

ClimateSMART CITIES

ASSESSMENT FRAMEWORK

Draft Indicators
Phase- II (2020)

ENERGY & GREEN BUILDINGS

URBAN PLANNING, GREEN COVER & BIODIVERSITY

MOBILITY & AIR

WATER RESOURCE MANAGEMENT

WASTE MANAGEMENT

DAY-NULM
Deendayal Antyodaya Yojana-National Urban Livelihoods Mission

HRIDAY

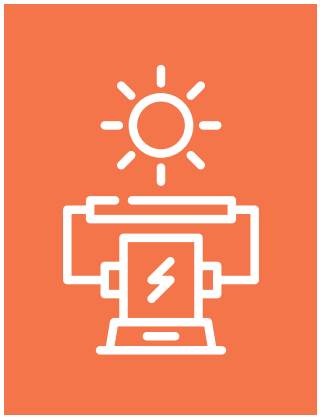
प्रधान मंत्री आवास योजना-शहरी
Pradhan Mantri Awas Yojana-Urban
Rejuvenating the Soul of Urban India

अमृत
Atal Mission for Rejuvenation and Urban Transformation

Urban Transport

Indicators

ENERGY AND GREEN BUILDINGS



Indicator 1: Total electrical energy in city derived from renewable sources

Rationale: Fossil fuels such as coal, natural gas and oil are the major sources of energy in our country. Green House Gases (GHG) are emitted while producing energy from fossil fuels thereby causing environmental issues. Production of energy from cleaner renewable energy sources (solar PV, solar thermal, wind energy, hybrid, hydel power, small hydro, geo-thermal energy, tidal energy) would minimize GHG emission.

Description: The indicator encourages the replacement of existing power demand from fossil fuels with cleaner, renewable energy sources.

Methodology: Identification of current electrical energy generated (KWH) and supplied from all grid connected renewable energy sources, as well as installed capacity of renewable energy sources for self-consumption (KW) as against the total electrical energy consumption (KWH) in the city and total connected load (KW) in the last year before assessment (based on bi-annual assessment).

Formula:

$$\left[(0.4x \frac{\text{Total electrical energy generated (in KwH) from all grid connected renewable energy sources within the city}}{\text{Total electricity consumption (in KwH) in the city}} \right) + (0.4x \frac{\text{Total electrical energy supplied (in KwH) from nected renewable energy sources to the city}}{\text{Total electricity consumption (in KwH) in the city+total number of units (in kWh) lost due to AT\&C loss}}) + (0.2x \frac{\text{Cumulative installed capacity(in KW)(Offgrid+Ongrid) from renewable energy sources for self consumption}^1}{\text{Total connected load (in KW) in the city}})] \times 100$$

[1]Includes both, ongrid and offgrid systems and the city is required to provide breakup of data and evidences of such systems from relevant authorities.

Unit: Percentage(%) **Maximum Score:** 100

Performance Evaluation Levels:

	0	1	2	3	4
Criteria/ Sub-indicators/ Progression Levels	No power generated from renewable sources	Less than 5% of the city power demand is from renewable energy	5 to 10% of the city power demand is from renewable energy	10 to 25% of the city power demand is from renewable energy	25% and above of the city power demand is from renewable energy
Evidence/ Data Sources	• Data on electrical energy generated within the city and electrical energy supplied to the city from all grid connected renewable energy sources can be obtained from DISCOMs • Data on total electricity consumption can be obtained from local power distribution companies (DISCOMs) • Data on grid-connected renewable energy supplied incl. RPOs, verified by State Energy Development Agencies (SEDA) giving any subsidies • Installed renewable energy capacity in the city (off-grid systems to be provided by State Energy Development Agencies (SEDA) and on grid systems to be provided by DISCOMS				
Reference Documents	Energy Statistics (MOSPI; 2018) http://mospi.nic.in/sites/default/files/publication_reports/Energy_Statistics_2018.pdf				
Responsible Agency/ Department	DISCOMs, ULB, SEDA	DISCOMs, ULB, SEDA	DISCOMs, ULB, SEDA	DISCOMs, ULB, SEDA	DISCOMs, ULB, SEDA
Score	0	25	50	75	100

Indicator 2: Per capita and Per area electricity consumption for municipal services*

**Street lights, water supply, waste treatment, sewerage treatment, municipal buildings, govt.hospitals/clinics, other municipal services (fire services, municipal schools, parks and gardens,community halls, cremation facilities)*

Rationale: Growing urban areas and urban population are increasing the electricity demand in cities. Fossil fuel consumption is increasing in order to cope with this growing demand for electricity, leading to higher GHG emissions. Controlling the per capita and per area consumption of electricity for municipal services will lead to lower GHG emissions.

Description: The indicator assesses the amount of electricity that is used by the city for its municipal services (Street lights, water supply, waste treatment, sewerage, municipalbuildings, govt.Hospitals/clinics, other municipal services (fire services, municipal schools, parks and gardens, community halls, cremation facilities)) and encourages lower consumption in comparison to the best performing cities.

Methodology: City(s) with the lowest consumption (amongst cities in the same Tier) will be treated as a benchmark (referred to as "X") to calculate the total electricity consumption against the density of the city. Consumption figures would be taken for the last year before assessment (financial year for June assessment, Oct-Sep for December assessment)[2].

Formula:

$$\left\{ \frac{\text{Total electricityconsumption (KWH) for street-lights + Total electricity consumption (KWH) for water supply + Total electrical energy consumption (KWH) for waste and sewerage treatment + " @"Total electricity consumption (KWH) for municipal buildings + Total electricity consumption for govt Hospitals/clinics+ Total electricity consumption (KWH) for other municipal services}}{\text{Density* of the city}} \right\}$$

**Density = Total population of the city /total area in sq.km*

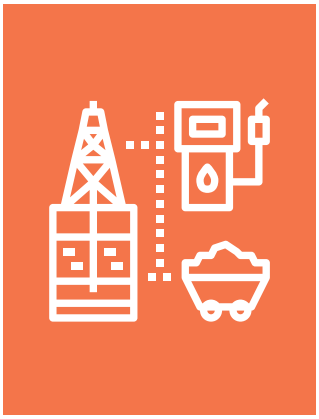
Unit: kwh per capita per sq.km

Maximum Score: 100

Performance Evaluation Levels:

	0	1	2	3	4
Criteria/ Sub-indicators/ Progression Levels	Above 10x as compared to the city with the lowest per capita consumption (amongst Tier I, II & III)	Above 4X &upto 10X as compared to the city with the lowest per capita consumption (amongst Tier I, II & III)	Above 2x & upto 4x as compared to the city with the lowest per capita consumption (amongst Tier I, II & III)	Above 1.1x & upto 2x as compared to the city with the lowest per capita consumption (amongst Tier I, II & III)	Upto 1.1x as compared to the city with the lowest per capita consumption (amongst Tier I, II & III)
Evidence/ Data Sources	• Municipal Electricity bills • Municipal Budget document • Total area of the city • Census of India population figures indexed with average annual growth rate for the year 2018 as per SCP				
Reference Documents	Manual for the Development of Municipal Energy Efficiency Projects (BEE; 2008) https://beeindia.gov.in/sites/default/files/ctools/Manual-fortheDevelopmentofMunicipalEnergyEfficiencyProjects.pdf				
Responsible Agency/ Department	DISCOMs, ULB				
Score	0	25	50	75	100

[2]if certain cites fail to provide electrical consumption data for any service(s), those cities will be evaluated based on the highest electricity consumption data reported by cities of similar scale/tier for such service(s)



Indicator 3: er capita fossil fuel (Diesel, Petrol, CNG, LPG) consumption for municipal services*

Street lights, water supply, waste treatment, sewerage, govt.Hospitals/clinics, municipal buildings, other municipal services (fire services, municipal schools, parks and gardens, govt.Hospitals/clinics, community halls, cremation facilities)

Rationale: Diesel, Petrol, CNG and LPG are the major source of energy for municipal services in India, leading to increasing GHG emissions. This indicator aims to incentivise cities to lower their per capita CO2 emission while encouraging them to switch to alternative cleaner fuel sources for municipal services.

Description: The indicator will assess the amount of fossil fuels i.e. Petrol, Diesel, CNG, LPG utilized for undertaking the daily municipal services (Street lights, water supply, waste treatment, sewerage, municipal buildings, govt.Hospitals/clinics, other municipal services (fire services, municipal schools, parks and gardens, community halls, cremation facilities))

Methodology: City(s) with the lowest per capita fuel consumption on municipal services (amongst cities in the same Tier) will be treated as benchmark (referred to as "X"). The consumption of diesel, petrol, CNG and LPG will be calculated against the total population of the city in the last year before assessment (financial year for June assessment, Oct-Sep for December assessment).

Formula:

$$\frac{\text{Total } TCO_2e^* \text{ of fossil fuel (diesel+petrol+CNG+LPG) consumption by the city for municipal service's}^3}{\text{Total population of the city}}$$

**Total TCO_2e = (Total diesel consumption x2.62694 + Total petrol consumptionx2.20307 + Total LPG Consumption x1.51906 + Total CNG Consumption x0.48066)*

Unit: Tons CO_2 equivalent per capita

Maximum Score: 100

Performance Evaluation Levels:

	0	1	2	3	4
Criteria/ Sub-indicators/ Progression Levels	Above 10x as compared to the city with the lowest per capita consumption (amongst Tier I, II & III)	Above 4x & upto 10x as compared to the city with the lowest per capita consumption (amongst Tier I, II & III)	Above 2x & upto 4x as compared to the city with the lowest per capita consumption (amongst Tier I, II & III)	Above 1.1x & upto 2x as compared to the city with the lowest per capita consumption (amongst Tier I, II & III)	Upto 1.1x as compared to the city with the lowest per capita consumption (amongst Tier I, II & III)
Evidence/ Data Sources	• Separate Petrol, Diesel, LPG, CNG (in Kiloliters) consumption bills and contractor fuel bill payments from Municipal budget for each category • Census of India population figures indexed with average annual growth rate for the year 2018				
Reference Documents	Draft National Energy Policy (NITI Aayog; 2017) https://niti.gov.in/writereaddata/files/new_initiatives/NEP-ID_27.06.2017.pdf				
Responsible Agency/ Department	ULB				
Score	0	25	50	75	100

[3]Break up of fossil fuel consumption for different municipal services to be provided by cities.

Indicator 4: Energy efficient street lighting in the city

Rationale: Street lighting is a major contributor to the city's electricity consumption. Energy efficient Street Lighting systems will reduce the dependence on electricity from fossil fuels thus indirectly reducing GHG emissions in the city.

Description: The indicator will assess the extent to which cities shifted to use of energy efficient street lights and smart street-lighting automation systems for better monitoring, operation and control of streetlights.

Methodology: The number of energy efficient street lights and the use of smart street-lighting automation systems in the city will be assessed against the total number of street lights in the city, as per the existing on-ground & commissioned status at the time of assessment.

Formula:

$$\left(0.8 \times \frac{\text{Total number of energy efficient street lights in the city}}{\text{Total number of street lights in the city}} + 0.2\right) \times \frac{\text{Total no of streetlights operated under Smart Street-lighting automation}^{4}}{\text{Total number of street lights in the city}} \times 100$$

Unit: Percentage(%)

Maximum Score: 100

Performance Evaluation Levels:

	0	1	2	3	4
Criteria/ Sub-indicators/ Progression Levels	0 streets lights in the city are energy efficient	Upto 25% streets lights in the city are energy efficient	Upto 50% streets lights in the city are energy efficient	Upto 75% streets lights in the city are energy efficient	Upto 100% streets lights in the city are energy efficient
Evidence/ Data Sources	• Total number of street lights in the city • Municipal records/documentary evidence for the number of street lights replaced with energy efficient street lights • Municipal records/documentary evidence for installation of street lighting automation systems				
Reference Documents	Energy Efficient Street Lighting (BEE; 2010) https://beeindia.gov.in/sites/default/files/ctools/Energy%20Efficient%20Street%20Lighting%20Guidelines.pdf				
Responsible Agency/ Department	ULB				
Score	0	25	50	75	100

[4]Any level of automation such as installation of smart street-lighting panels for voltage/load control, dimming, remote switching on and off, alternative street lighting on and off and/or establishment of Street lighting SCADA and control centre for remote monitoring, control and operation of streetlights etc is acceptable.

Indicator 5: Level of compliance, implementation procedures and stakeholder co-operation in place for green buildings

Rationale: Buildings, throughout their life cycles, are one of the prime contributors of GHG emissions in the city. In order to encourage the construction and use of green and energy efficient buildings, national and energy conservation of building codes are updated and notified by Government. There are a number of compliances, implementation procedures and stakeholder co-operation that needs to be in place from the city's side for green buildings. This indicator checks the readiness of the city with regard to these compliance procedures, penalty/reward schemes and stakeholder co-operation for subsequent promotion of green and energy efficient buildings

Description: Extent of compliance and implementation procedures at city level for various systems of green buildings like adoption of the latest National Building Code (NBC) 2016, Energy Conservation Building Code (ECBC) 2017mention in the General Development Control Regulations (GDCRs), building byelaws/rules, formation of green building cell in ULBs, reward/penalty schemes available for pre-certification and certification (as per latest rating systems such as NBC 2016,ECBC2017 and the Star Rating for Buildings both by the Bureau of Energy Efficiency (BEE) and other rating systems likeLeadership in Energy & Environmental Design (LEED) and Excellence in Design for Greater Efficiencies (EDGE) of the Green Building Certification Inc. (GBCI); Green Rating for Integrated Habitat Assessment (GRIHA) of The Energy Research Institute (TERI), Green Building Rating System of the Indian Green Building Council (IGBC),upto minimum level i.e. 1-star (ECBC, BEE Star, GRIHA) or basic certified (LEED, IGBC)) and formation of city/state level green building committee for stakeholder co-operation.

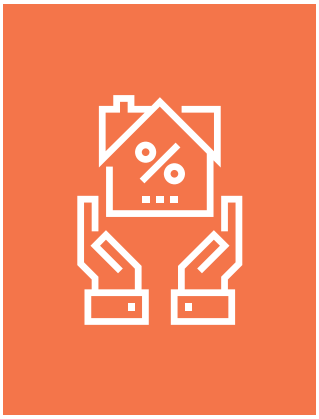
Methodology: This indicator measures the inclusion of provisions of Codes & Regulations for 'green buildings' as indicated above for Level 1 & 2 below, and pre-certifications achieved for 'green buildings' third-party pre-certifications given to new buildings sanctioned in the city. For Level 1 & 2, the status of compliance at the time of assessment will be taken, and for Level 3 & 4, the pre-certifications acquired in the last year before assessment (bi-annual assessment) will be considered.

Formula: NIL

Maximum Score: 100

Performance Evaluation Levels:

	0	1	2	3	4
Criteria/ Sub-indicators/ Progression Levels	Compliance procedures available only at state level	Inclusion of latest National Building Codes (NBC 2016) and/or Energy Conservation Building Codes (ECBC 2017) (commercial & residential) as notified in City Development Control Regulations (DCRs/GDCRs), building rules/bye-laws	Functioning of Green building cell in ULB for the purpose of knowledge dissemination, creating public awareness, empanelling green building vendors, designing green building schemes and their promotions, verification and faster approvals for green buildings in the city	Promotional/Penalty schemes available for Pre-certification and Certification of green buildings in line with NBC 2016 and ECBC 2017 standards	Functioning of Green building committee (comprising of ULB green building cell, PWD and relevant government departmental representatives, city planners, building architects, construction developers, material suppliers, third party certification agencies, consultants and other relevant green building stakeholders) and green building publications in regional languages
Evidence/ Data Sources	Previous versions of NBC,ECBC, compliance available at state level	Latest version of NBC 2016 and or ECBC 2017 Compliance procedures available at city level	ULB records, Gazette notifications, Government Orders, Office Circulars, Public notices, Departmental Orders, Internal circulars, Communications, meeting notices, meeting minutes, public awareness campaigns (English, Hindi and regional languages),training programs conducted, updating green homes and buildings curriculum in schools and colleges and/or other relevant documents as data and evidences.		
Reference Documents	NATIONAL BUILDING CODE (BIS; 2016) http://ukfireservices.com/uttarakhand_fire/wp-content/uploads/2018/04/NBC-2016-VOL.1-Part-4-Fire-and-Life-Saftey.pdf				
Responsible Agency/ Department	ULB, PWD, Town Planning Dept.,				
Score	0	25	50	75	100



Indicator 6: Percentage of buildings securing green building pre-certification and final certificationup to minimum level

Rationale: In continuation to the previous indicator, this one encourages the design and construction of new buildings as per the green building norms as defined in the ECBC and BEE.

Description: It assesses the total number of pre-certified buildings and actual Built-up Area (BUA) of "green buildings" that are certified (as per different existing norms and incentivises the city for promoting green building) with respect to the total number of buildings approved for construction and total BUA of all buildings completed in the city in a given year, as a means of knowing the impact on GHG emissions in the city.

Methodology: Pre-certification of design and amount of Built up area (BUA) of green buildings third-party certified upto minimum level i.e. 1-star (ECBC, BEE Star, GRIHA) or basic certified (EDGE, LEED, IGBC) at construction and completion stage respectively; compared to total number of buildings approved for construction and the BUA of all the buildings completed in a city respectively, in the last year before assessment (financial year for June assessment, Oct-Sep for December assessment).

Formula:

$$\left(0.2 \times \frac{\text{Total number of pre-certified buildings for the assessment period}}{\text{Total number of buildings approved for construction for the assessment period}} + 0.8 \times \frac{\text{BUA of green buildings certified for the assessment period}}{\text{BUA of all buildings completed for the assessment period}} \times 100\right)$$

Unit: Percentage(%)

Maximum Score: 100

Performance Evaluation Levels:

	0	1	2	3	4
Criteria/ Sub-indicators/ Progression Levels	No green buildings certified	Upto 10% BUA in the base year are certified	Upto 40% BUA in the base year are certified	Upto 60% BUA in the base year are certified	All buildings in the base year are certified
Evidence/ Data Sources	• List of pre-certified green buildings at design stage • List of all buildings approved for construction • List of buildings certified with Green building certificate along with BUA, as per the methodology. • List of all buildings along with total BUA completed in the base year, as per the Completion Certificates issued.				
Reference Documents	Certifying A Green Building (CERC & ENVIS; 2014) http://cercenvis.nic.in/PDF/jul_sep_2014.pdf				
Responsible Agency/ Department	ULB, Town Planning Dept., Green Building agencies.				
Score	0	25	50	75	100

URBAN PLANNING, GREEN COVER AND BIODIVERSITY

Indicator 1: Climate Action Plan

Rationale: As part of the Paris Agreement on climate change (2015), many nations committed to take immediate action to keep the global temperature rise below 2°C of pre-industrial levels. In 2016 India ratified the Paris Agreement and committed under its 'nationally determined contributions' (NDCs) among others to reduce the emission intensity of its GDP by 33-35% from 2005 level by 2030; to achieve about 40% cumulative electric power installed from non-fossil fuel based energy resources by 2030 and to create an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030. With much of India's development dependent on cities, consistent with the objectives of the Paris Agreement, cities urgently need to plan and implement climate actions in an integrated and inclusive way through the following measures: mitigation of greenhouse gas emissions and adaptation to climate change impacts to foster wider social, cultural, economic and environmental benefits.

Description: Climate Action Plan (mitigation and adaptation) has to be prepared and implemented by the city. It should be developed in a comprehensive manner covering all sectors, including waste management, integrated water management, mobility and air pollution, energy and green buildings; biodiversity, green cover, disaster risk preparedness and urban planning. The plan has to propose actions for both climate change mitigation and adaptation based on a GHG emissions inventory and a climate change vulnerability assessment respectively, addressing all sectors listed above. Regular monitoring, reporting and verification (MRV) of the plan is essential to qualify and quantify the measures implemented for achieving accountability, and improved impact.

Methodology:

Climate Change Mitigation: GHG emission inventory to be prepared for all sectors on the basis of the Global Protocol for Community Scale GHG Emissions (GPC).

Climate Change Adaptation: *Vulnerability Assessment for the city*: The Intergovernmental Panel on Climate Change (IPCC) identifies three components of climate change vulnerability: exposure, sensitivity and adaptive capacity. Manifold toolboxes and collections of methods to evaluate impacts, vulnerability and adaptation to climate change exist. Requested is the development of a vulnerability assessment and identification of gaps, undertaken based on the United Nations Framework Convention on Climate Change (UNFCCC) methodology

Climate Action Plan: Based on the GHG inventory as well as on the vulnerability assessment, a Climate Action Plan for the city addressing all issues of mitigation and adaptation has to be developed. The Guiding Principles for City Climate Action Planning from UN-HABITAT could be referred to, however the sectors to be covered under the plan should at least include all sectors as covered under the ClimateSmart Cities Assessment Framework.

Formula: NA **Unit:** NA **Maximum Score:** 100

Performance Evaluation Levels:

	0	1	2	3	4
Progression Levels	**Climate Action Plan**	**Institutional Mechanism Established**	**Plan Prepared**	**Implementation**	**Regular Monitoring & Streamlining**
Evidence/ Data Sources	Climate Action Plan not considered	• ULB Level Climate coordination cell established • City Level Stakeholder Committee constituted and consulted regularly • City level climate assessments have been initiated	• Climate Change Vulnerability assessment conducted (see indicator no 2 Disaster Risk Preparedness) • Identification and mapping of encroachment (see indicator no 3 Rejuvenation and Conservation) • City heat island map (see indicator no 3 Rejuvenation and Conservation) • Climate Change mitigation areas assessed for the city • Climate Action Plan (mitigation and adaptation) prepared for the city in a participatory manner	• Funds/ Municipal Budget of last financial year shows allocation • Framework for Monitoring Reporting and Verification (MRV) prepared (sector-wise) • Implementation of measures initiated (at least one of the following: utilisation certificate; by-law, DPRs)	• MRV system implemented for the city - regular monitoring (bi-annual) of climate relevant actions indicated in the action plan • Updated Climate Action Plan available (if older than 5 years) and prepared in a participatory manner • Relevant features from the Climate Action Plan incorporated in master plan to ensure sustainability
Responsible Agency/ Department	ULB, State/City Transport Department, State Disaster Management Authority, State Revenue Department; State Irrigation Department; Development Authority, Town Planning Department, National Remote Sensing Agency, State Remote Sensing Agency; Forest Department				
Reference Documents	Surat Resilience Strategy http://www.100resilientcities.org/wp-content/uploads/2017/07/-Surat_Resilience_Strategy_PDF.pdf Coimbatore Climate Action Plan (Summary) http://capacitiesindia.org/wp-content/uploads/2018/04/Coimbatore_CRCAP.pdf				
Score	0	25	50	75	100

Indicator 2: Disaster Resilience

Rationale: In urban areas the brunt of any kind of disaster (Human or nature induced) is borne by the urban inhabitants and also by the urban infrastructure. As effects of climate variability leading to extreme events are becoming more severe and frequent, the incidents of damage to urban infrastructure are also increasing. Therefore, it is important that all cities, especially Smart Cities, should not only be able to identify their potential hazards, vulnerabilities and risk but also be prepared for prompt response during disaster situation as well as have robust plans in place to "Build Back Better" including recovery, reconstruction and rehabilitation.

Description: To what extent the city is prepared and resilient to tackle natural and manmade disasters.

Methodology:

Disaster Management Plan: The National Disaster Management Act, 2005, the National Policy on Disaster Management 2009 (NPDM) and the National Disaster Management Authority (NDMA) provide direction and a framework to the government agencies at all levels (National, State and Local) to prepare for all phases of disaster management cycle i.e. a) mitigation (prevention and risk reduction), b) preparedness, c) response and d) recovery (immediate restoration to long-term betterment reconstruction).

In accordance with the provisions of the Disaster Management Act and the policy a National Disaster Management Plan (NDMP) is prepared, which is a dynamic document and it need to be periodically updated. Similarly, each State, District / City level plans has to be prepared in line with the NDMA guidelines (2014) issued by the National Disaster Management Authority.

Emergency Management Plan: Emergency Management Planning results in organized and coordinated courses of action with clearly identified institutional roles and resources, information processes and operational arrangements for specific actors at times of need. Based on scenarios of possible emergency conditions, it allows key actors to envision, anticipate and solve.

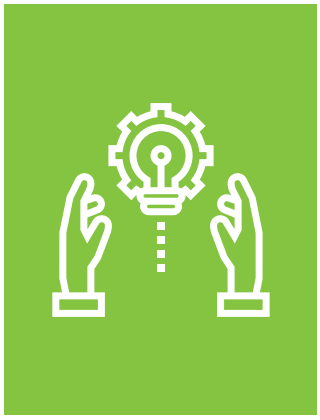
Ward-level Hazard Risk, Vulnerability and Capacity Assessment: The municipal administration along with the ward level officers shall initiate a participatory process among the community groups and the representatives of ULBs to assess the vulnerabilities and risks to various hazards in their respective areas. Wherever possible the disaster management (DM) teams shall be involved in the process. Please refer to the National Policy Guidelines, National Disaster Management Authority.

Early Warning Systems: An effective Early warning System needs to be end-to-end, people-centred, across sectors and multiple levels with a continuous feedback mechanism for improvement.

Formula: NA **Unit:** NA **Maximum Score:** 100

Performance Evaluation Levels:

	0	1	2	3	4
Progression Levels	**Disaster and Risk Reduction is yet to be prioritised**	**Disaster Management Plan I**	**Disaster Management Plan II**	**Implementation**	**Monitoring, Updating Mainstreaming**
Evidence/ Data Sources	Disaster risk reduction has been initiated by the district administration. No sperate efforts for preparing the city disaster management plans are underway.	• City Level Disaster Management Plan, prepared as per NDMA Guidelines including community participation, vetted by State DMA • City level loss and damage data has been collated and documented (last 5 years)	• Ward-level Hazard Risk, Vulnerability and Capacity Assessment prepared for the current year in a participatory manner (based on NDMA Guidelines, 2014) • Institutionalising and establishing of dedicated Disaster Management Cell/ Emergency Operation Centre (EOC) within ULB	• Emergency Management Plan are in place for the key departments within the ULB • Functioning Early warning systems installed incl. helpline and early warning systems along Weather Forecasting • System are linked to Integrated Command and Control Centres (ICCC) for regular monitoring and managing emergency situations	• Trained task force or volunteers for disaster response are in place (including conduction of annual mock drills) • The States/City level Building Bylaws/ Development Controls/ Codes address hazard and vulnerability identified at level 2 • Mainstreaming disaster risk reduction in departmental plans within the ULB
Reference Documents	Greater Chennai City Disaster Management Plan, 2017 http://www.chennaicorporation.gov.in/NorthMonSoon2017/cdmcb.pdf Ahmedabad Heat Action Plan, 2019 https://www.nrdc.org/sites/default/files/ahmedabad-heat-action-plan-2018.pdf				
Responsible Agency/ Department	ULB in coordination with District administration, State Disaster Management Authority, State Revenue Department; State Irrigation Department				
Score	0	25	50	75	100



Indicator 3: Rejuvenation and Conservation of Urban Environment (water bodies, open spaces and built-up area)

Rationale: Urban Environment consists of many aspects including water bodies, open spaces and built-up area. From climate adaptation and mitigation perspective all three aspects play a critical role.

Rejuvenation of water bodies is significant to combat water crises. Water bodies are essential as reservoirs for drinking, as retention basins for groundwater recharge, for protection in case of floods and for maintaining biodiversity. Having local sources of fresh water decreases the dependence on energy for pumping purposes.

Open spaces, namely recreational spaces, organised green and other common open spaces in any city play a critical role in terms of climate mitigation and adaptation aspects by decreasing local temperature and helps recharge groundwater.

Increase in build-up areas and decrease of water bodies and open spaces lead to an increase in the local temperature within a city.

Description: To what extent (Percentage and area) is the city rejuvenating and conserving Urban Environment (water bodies and open area) and manages to decrease the heat-island effect.

Methodology: The information concerning the current status and status of previous assessment where the area and percentage has to be derived from satellite images. This figure has to be compared with the existing masterplan (percentage and area). As area border the municipal boundary has to be considered. Open Spaces are defined as recreational spaces, organised green and other common open spaces as per URDPFI Guidelines section 8.4.5. For generating the areas as indicated in level 1 below, current municipal boundary has to be considered for both the cases.

Urban Heat Island: An urban heat island is an urban area or metropolitan area that is significantly warmer than its surrounding areas/ rural areas due to human activities.

Formula: Assessment of Urban Environment (Water Bodies and Open Areas):

Level :

$$\frac{\textit{Water Bodies in sq.km (current year)}}{\textit{Water Bodies in sq.km (previous assessment)}} \textit{ x 100 = \% (within current municipal boundary)}$$

$$\frac{\textit{Open Areas in sq.km (current year)}}{\textit{"Open Areas in sq.km (previous assessment)}} \textit{ x 100 = \% (within current municipal boundary)}$$

Unit: sq.km, %

Maximum Score: 100

Performance Evaluation Levels:

	0	1	2	3	4
Progression Levels	**Action/ Process initiated**	**Assessment of Urban Environment (water bodies, green cover and built-up area, Unbuilt open spaces)**	**Strategy for Rejuvenation and Conservation of Urban Environment**	**Allocation of Budget and Implementation**	**Increase in Area and Percentage**
Evidence/ Data Sources	• Discussions to improve the urban environment have taken place but no assessments have been initiated	• Mapping of water bodies which includes their location, area, depth, volume and its current status has been carried out for the current year. • Map of the city open areas has been prepared for the current year	• Areas (water bodies and open areas) which have been encroached have been identified and mapped • Strategy to conserve and improve water bodies has been developed • City heat-island map developed for the current year	• Funds/ Municipal Budget allocated for conservation and rejuvenation • Implementation of strategy is initiated (at least one of the following: utilisation certificate; by-law, notification of the area, constitution of a committee, DPRs)	• Percentage and area (sq.km) of rejuvenated and conserved Urban Environment increased from the previous year estimates
Reference Documents	Lake Rejuvenation in Udaipur smartnet.niua.org/sites/default/files/resources/22.pdf				
Responsible Agency/ Department	ULB, Development Authority, Town Planning Department, National Remote Sensing Agency, State Remote Sensing Agency				
Score	0	25	50	75	100

Indicator 4: Proportion of Green Cover

Rationale: Sufficiently large and protected greenspaces reduce the impact of human activities on climate. The ecosystem services provided by the urban greenspaces help the city in general and its citizens to adapt to the adverse effects of climate change and disasters

Description: To what extent is the city developing and increasing its green cover. Green Cover, defined as natural or planted vegetation covering a certain area of terrain, functioning as protection against soil erosion, protecting the fauna, and balancing the temperature.

Methodology: Data available on area of urban greens can be analysed from satellite imagery. Recent imagery can be procured from the state or National Remote Sensing Centre (NRSC). Baseline year: 2019. Comparative analysis using the formula given below on a yearly basis will help to understand the increase/decrease over time.

Formula:

$$\frac{\textit{Green Cover in sq.km}}{\textit{municipal area in sq.km}} \times 100 = \%$$

$$\frac{\textit{Green cover in sq.km (current year)}}{\textit{Green cover in sq.km (previous assessment)}} \times 100 = \%\ \textit{(within current municipal boundary) percentage change}$$

Unit: Percentage(%) **Maximum Score:** 100

Performance Evaluation Levels:

	0	1	2	3	4
Progression Levels	0% to < 5% Green Cover	5% to < 9% Green Cover	9% to < 12% Green Cover	12% to < 20% Green Cover	≥ 20% Green Cover
Evidence/ Data Sources	The evidence will be comparative satellite images of the city.				
Reference Documents	Advisory on Urban Green Cover and Biodiversity, WWF, 2019 https://smartnet.niua.org/csc/assets/pdf/knowledge-repository/UP-Green-Cover-Biodiversity/WWF-Advisory-on-Urban-Green-Cover-and-Biodiversity.pdf				
Responsible Agency/ Department	National Remote Sensing Centre, State Remote Sensing Centre, Urban Planning or Development Authority, Forest Department				
Score	0	25	50	75	100

Indicator 5: Proportion of Native Tree Species

Rationale: Native tree species are more resilient to changes in local environment- as compared to exotic tree species, and therefore have a greater ability to adapt to climatic stress. This resilience also results in low maintenance costs for the local administration. Further, being part of the ecosystem for longer time, native tree species have highly intricate food webs and ecological network and contribute towards ecosystem stability and resilience. Thus, a high proportion of native tree species means more stable and resilient ecosystem, which can support higher biodiversity. High species numbers and high proportion of native tree species in an urban area can serve as a proxy indicator for high biodiversity and ecosystem resilience.

Description: TTo what extent is the city acting towards developing and maintaining its green cover using an ecological approach, specifically focusing on native tree species. Native tree species contributing to climate change mitigation and adaptation, such as avoidance of erosion, mitigation of air pollution, reduction of water usage, regulation of microclimate, reducing the risk of disasters.

Methodology: Data on species planted can be obtained from the Forest Department, Horticulture Department. Species survey data can be obtained from local Universities, NGOs and Forest Department. The performance evaluation can be on the basis of incremental level of dominance that native tree species occupy in a given urban ecosystem. For this, the basic measure is the percentage (by species numbers) of native tree species, i.e. how many tree species exist in the ecosystem (species richness), and out of these how many are native species. However, the actual proportion of native species can be measured by assessing the actual population (number of trees) of native species.

Formula:

$$\text{Level 5: } \frac{\textit{Number of individuals of native species}}{\textit{Total number of individuals of all tree species}} \; x\,100 = \%$$

Unit: Percentage(%) **Maximum Score:** 100

Performance Evaluation Levels:

	0	1	2	3	4
Progression Levels	**Action/ Process initiated**	**Assessment of native tree species**	**Planning for native tree species in place**	**Action Plan Implementation is in place**	**Action evident**
Evidence/ Data Sources	Discussion meetings on fostering native tree species within the city initiated but no action has been taken yet	Native tree species mapping has been carried out	Action plan to increase the native tree species has been drafted and has been approved	Funds within Municipal Budget allocated, or other sources identified for conservation and fostering of native tree species Actions to foster native tree species has been implemented.	The city has native species occupying >50% of the total tree cover
Reference Documents	Pimpri Chinchwad Municipal Corporation City Biodiversity Index, 2019 https://www.pcmcindia.gov.in/admin/cms_upload/download_data/13674949661559394147.pdf				
Responsible Agency/ Department	ULB, Forest Department, Universities, PWD, Horticulture Department Environment Department				
Score	0	25	50	75	100

Indicator 6: Urban Biodiversity

Rationale: Urban biodiversity provides significant ecosystem services contributing to climate change mitigation and adaptation, such as carbon sequestration, air and water purification, mitigation of impacts of environmental pollution, noise reduction, and regulation of microclimate. High biodiversity increases the resilience of the city.

Description: To what extent is the city acting for protection, conservation and management of urban biodiversity.

Methodology: Data on biodiversity can be obtained from the Biodiversity Management Committee and the people's Biodiversity register (instituted based on the Biological Diversity Act, 2002)

Formula: NA **Unit:** NA **Maximum Score:** 100

Performance Evaluation Levels:

Progression Levels	0	1	2	3	4
Progression Levels	**Action/ Process initiated**	**Institutional Set-Up**	**Baseline Assessment**	**Plan**	**Implementation**
Evidence/ Data Sources	• Discussions have taken place but no formal actions have been initiated so far.	• Establishment of City Level Biodiversity Management Committee (as per Biological Diversity Act, 2002; City council resolution; announcement to State Biodiversity Board)	• People's Biodiversity Register (based on the Biological Diversity Act, 2002, Letter of State Biodiversity Board validating register) • Inventory (all forms of technical reports/ studies) of urban ecosystems and species (including International Union for Conservation of Nature, IUCN listed ones)	• Funds/ Municipal Budget allocated • Identification of measures to increase biodiversity within master plan/ greening plans/ rejuvenation plans (see indicator no. 3 on 'Rejuvenation and Conservation of Urban Environment')	• Calculation of City Biodiversity Index (Report with the calculated index) • Implementation of measures initiated (defined in level 4)
Reference Documents	Advisory on Urban Green Cover and Biodiversity, WWF, 2019 https://smartnet.niua.org/csc/assets/pdf/knowledge-repository/UP-Green-Cover-Biodiversity/WWF-Advisory-on-Urban-Green-Cover-and-Biodiversity.pdf				
Responsible Agency/ Department	ULB; Biodiversity Management Committee, State Horticulture Department, State Forest Department				
Score	0	25	50	75	100

MOBILITY AND AIR

Indicator 1: Low Carbon Mobility

Rationale: The Low Carbon Mobility Plan (LCMP) provides a long-term vision for sustainable mobility for people, and the movement of goods in cities. The LCMPs advocates an integrated approach – e.g. looking at land use and transport planning, social inclusion, and the integration of safety, environment and CO_2 mitigation

Description: To what extent does the city show preparedness towards low carbon mobility during various stages i.e. strategy development, planning, funding and implementation

Methodology: In order to reduce its emission and control the pollution levels connected to mobility, the city must plan, initiate and implement low carbon mobility actions based on a City Mobility Plan (CMP)/ Low Carbon Mobility Plan (LCMP)/ Comprehensive Traffic and Transportation Studies (CTTS) based on the MoHUA toolkit on 'Comprehensive Mobility Plan 2014 or latest update.

Formula: NA **Unit:** NA **Maximum Score:** 100

Performance Evaluation Levels:

	1	2	3	4	5
Progression Levels	**No consideration of Low Carbon Mobility**	**Citywide assessment/ plan for mobility exists**	**Plan with specific focus on low carbon mobility**	**Allocation of budget and monitoring framework**	**Implementation of measures**
Evidence/ Data Sources		• City-wide document with mobility status assessment (CDP, SCP, Masterplans) or any other assessment of transport network in the city (relevant section to be highlighted and uploaded) or Metro Assessment report/ metro DPR prepared after year 2005	• CMP/LCMP/CTTS as per the latest toolkit of MoHUA	• Allocation of State Level/ Smart City budget as per the plan highlighting transport sector funds/investment • Establishment of implementation & monitoring framework for the plan	• 50% of projects implemented as planned under • CMP/LCMP/CTTS.
Reference Document	Preparing a Comprehensive Mobility Plan (CMP)—A Toolkit (MoHUA, 2014) https://smartnet.niua.org/content/4152272f-2bbf-41bb-a11f-e9d8865f4271				
Responsible Agency/ Department	Municipal Corporation, City Development Authority, Smart City SPV's, UMTA				
Score	0	25	50	75	100

Indicator 2: Low Carbon Shared Vehicles

Rationale: Since conventional fuel burning vehicles release an enormous amount of intoxicants to atmosphere, cities must put efforts to introduce a more cleaner fuel based shared vehicles.

Description: Percentage of low carbon buses/ Taxies/ app-based cabs/ app based two wheelers/Autos/ e-Rickshaw/ Private Buses/ Ferries (based on CNG, LPG, Hybrid, Biofuels, Electric) of the total shared vehicles.

Methodology: Annual number of low carbon shared vehicles and shared vehicles in total can be obtained from the State/ Municipal Corporation, the SPV's - Public Transport companies, the City Development Authority, and the Smart City SPV's. Data has to be collected by type of fuel. In case the data on fuel type is not available with RTO in such cases information needs to be collected on sample basis through primary surveys to arrive at an estimated fuel base of shared vehicles.

Formula: $$\text{Percentage share of low carbon fleet (\%)} = \left\{ \frac{(n\text{Total number of shared vehicles on clean fuel})}{(\text{Total no.of shared vehicle in the city})} \right\} x100$$

Unit: Percentage(%) **Maximum Score:** 100

Performance Evaluation Levels:

	1	2	3	4	5
Progression Levels	**No low carbon shared vehicles available**	**Low carbon shared vehicles <25%**	**Low carbon shared vehicles >25%**	**Low carbon shared vehicles >50%**	**Low carbon shared vehicles >75%**
Evidence/ Data Sources	Registration data from regional transport office by type of fuel				
Reference Document	Open Government Data Platform https://data.gov.in/catalog/number-newly-registered-motor-vehicles-and-number-registered-motor-vehicles-delhi?filters%5Bfield_catalog_reference%5D=101163&format=json&offset=0&limit=6&sort%5Bcreated%5D=desc Moving Forward Together, Enabling Shared Mobility in India (NITI Aayog; 2018) https://niti.gov.in/writereaddata/files/document_publication/Shared-mobility.pdf				
Responsible Agency/ Department	State/ Municipal Corporation, SPV's – Public Transport companies, City Development Authority, Smart City SPV's				
Score	0	25	50	75	100

Indicator 3: Availability of Public Transport

Rationale: Under Smart City initiatives most of the selected cities are planning for organized public transport system. Increase in extent of supply availability of public transport can be a key factor to evaluate the modal shift from private transport to public transport, which in turn helps tremendously to reduce emissions from the transport sector.

Description: The population growth had put forth a tremendous demand for infrastructure and mismatch between demand and supply of transport infrastructure resulted in delays, fuel loss, air and noise pollution and accidents and loss of productive time and energy. Extent of supply availability of public transport is one of the Service level performance benchmarks.

Methodology: The data could either be taken through previous studies, secondary sources or captured through specific primary surveys. This data would be the basis for the establishing the base year benchmarks of various parameters. The data collected from the primary and secondary sources need to be collated and analysed.

Formula: **Ridership Index (RI) =**

$$\left\{ \frac{\textit{Fleet size of PT (bus+metro coach+suburban rail coach+Ferries) x 1000}}{\textit{Estimated existing population of the city}} \right\}$$

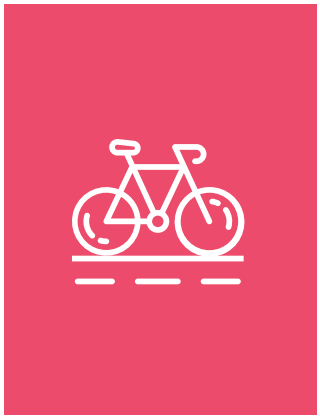
*1 metro or train coach or Ferry = 3 Buses

Unit: **Availability of Public Transport** (Metro, Tram, Buses, Ferries) per 1,000 population.

Maximum Score: 100

Performance Evaluation Levels:

	1	2	3	4	5
Progression Levels	**Availability of Public Transport (Nil)**	**Availability of Public Transport (<0.2)**	**Availability of Public Transport (0.2-0.4)**	**Availability of Public Transport (0.4-0.6)**	**Availability of Public Transport (≥0.6)**
Evidence/ Data Sources	Annual data from public transport Authorities companies				
Reference Document	Service Level Benchmarks for Urban Transport (MoHUA, 2010) http://mohua.gov.in/upload/uploadfiles/files/Service_level.pdf				
Responsible Agency/ Department	SPVs - Public Transport companies, Smart City SPVs and PMCs				
Score	0	25	50	75	100



Indicator 4: Percentage of coverage of Non-Motorized Transport network (pedestrian and bicycle) in the city

Rationale: Developing the Non-Motorized Transport (NMT) network in a city addresses the problems related to the high consumption of non-renewable energies, thus addressing air pollution and GHG emission production. Furthermore, it promotes aspects like health, traffic safety, traffic congestion and equal mobility-options for all income brackets.

Description: This indicator assesses the network length for dedicated cycle and pedestrian lanes in the city on major road network (all arterial, sub-arterial roads and public transport corridors).

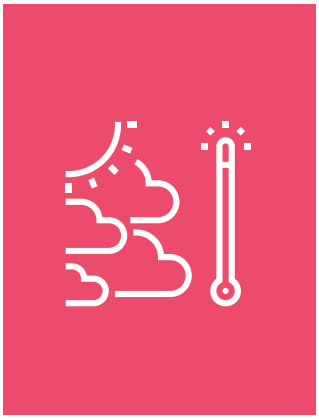
Methodology: Calculate the length of the major road. Calculate the total length of footpath and bicycle lanes. Footpath minimum width: 1.5m; Cycle lane minimum width: 2.5m, both designed as per the street design guidelines of MoHUA.

Formula: $\%\ of\ NMT = \left\{ \frac{Total\ length\ of\ NMT\ (footpath\ lenght\ in\ city + lenght\ of\ cycle\ track)\ network \times 100}{Total\ road\ network\ length} \right\}$

Unit: Percentage(%) **Maximum Score:** 100

Performance Evaluation Levels:

	1	2	3	4	5
Progression Levels	**NMT Coverage: Less than 15%**	**NMT Coverage: 15% to <25%**	**NMT Coverage: 25% to < 35%**	**NMT Coverage: 35% < 50%**	**NMT Coverage: ≥ 50%**
Evidence/ Data Sources	• NMT Network plan of city • Annual completed list of NMT and Pedestrian projects of Public Works department and Municipal Corporations • By-cycle lanes constructed by Public Works department in city				
Reference Document	Promoting Non-Motorized Transport in Asian Cities: Policymakers' Toolbox (UN-Habitat and Shakti Sustainable Energy Foundation; 2013) https://shaktifoundation.in/wp-content/uploads/2015/03/Promoting-NMT-in-Asian-Cities-Policymakers-Toolbox.pdf				
Responsible Agency/ Department	ULB, Public Works Department, City Development Authority, Transport Authority, Smart City SPV's and PMC's				
Score	0	25	50	75	100



Indicator 5: Clean Air Action Plan (Pollutant Monitoring, Planning and Implementation)

Rationale: Unsustainable urban planning, lack of proper waste management, obsolete technology in industries and urban transport have all led to increase in air pollution in cities in India. According to the World Health Organisation (WHO), seven million people die prematurely from health risks every year owing to air pollution. The Smart city Mission sets out to bring in its fold the urban policy design of public transit oriented urban mobility, smart parking, intelligent traffic management and integrated multi-modal transport, prioritising non-motorised transport, digitalisation of public services, and waste management e.g. reduction of C&D (construction and demolition) waste, all of which are good practices for better air quality. These are also actions that need to be emulated in the entire city.

Description: Cities should take onus for providing healthy air quality to the citizens. Clean Air Action Plans mandated by the National Clean Air Programme (2019) of Government of India integrate the cumulative city level actions for better air quality. For a city to be climate smart it should be able to address the issues of reducing air and climate pollutants since both air and climate pollutants arise from similar sources and addressing one has a direct co benefit to the other. Clean Air is integral for achieving climate smartness by a city.

Methodology: This indicator assesses to what extent the city has made efforts to improve the air quality, to generate/collate data on the key pollutants through enhanced monitoring mechanisms, to identify sources through scientific methods and subsequently to develop and implement sectoral strategies and projects that are components of the clean air action plan. This has to be done in close co-ordination with the State Level monitoring authorities and other stakeholder departments. The clean air action plan needs to be reviewed and monitored to assess improvements in air quality.

Formula: NA **Unit:** NA **Maximum Score:** 100

Performance Evaluation Levels:

	1	2	3	4	5
Progression Levels	**No Pollutant Monitoring**	**Basic Pollutant Monitoring**	**Pollutant Source Identification and Clean Air Action Plan**	**Implementation of Clean Air Action Plan**	**Monitoring**
Evidence/ Data Sources		• Monitoring Stations for measuring Ambient Air Quality (please indicate number of stations, differentiate between manual stations /continuous ambient air quality monitoring stations (CAAQMS) /continuous emission monitoring system (CEMS) / Sensors based monitoring systems • Air Quality Monitoring mechanism linked with ICCC	• Clean Air Action Plan prepared by SPCB based on CPCB guidelines as per National Clean Air Programme, (NCAP) developed based on scientific data captured in case of Non-attainment city. • Clean Air Action Plan developed by Municipal Authority in case of other cities • Scientific based on CPCB/SPCB led Source Apportionment Studies and Emissions Inventories	• Implementation of at least 2 measures under the domain of the ULB as specified in Clean Air Action Plan	• Impact assessment study for implementation of • Clean Air Action Plan measures with evidence of improvements in air quality • Air quality database management and dissemination to the stakeholders
Reference Document	National Clean Air Programme (MoEF&CC; 2019) http://cerca.iitd.ac.in/files/reports/NCAP%20Report%20Full.pdf				
Responsible Agency/ Department	CPCB, SPCB, ULB, Transport Dept, Smart city SPV, Environment Dept				
Score	0	25	50	75	100

Indicator 6: Level of Air Pollution

Rationale: Climate and air pollutants including CO2 emissions have a common origin- the current energy model. Both are worsened by the burning of fuel and increase the CO2 emissions. Sound urban planning and clean technologies are now recognised as solutions to air pollution. The smart cities present a unique opportunity to adapt to advanced air-quality-monitoring technologies. Cities are encouraged to adopt affordable technologies by introducing low-cost air-quality sensors and linking the latter to the Integrated Command and Control Centres. This approach can complement the Pollution Control Board's existing monitoring system to provide further data on localised areas, hot spots and help generate real-time information for cities to take corrective action as well as gauge improvements. Air pollution data will not only help the government in framing policies and measures but allow citizens to make informed decisions that can improve the

Description: The city is encouraged to assess to what extent it has achieved National and international Ambient Air Quality Standards (NAAQS),2009. The National Clean Air Programme sets a target of 20 -30 percent reduction of air pollution levels with 2017 as the base year. A city level air-quality monitoring grid is important to generate holistic data, helps to assess the risks, implements control measures and assesses other climate smart strategies adopted by the city.

Methodology: The indicator assesses the city-level air quality monitoring mechanism, its strengthening requirements and availability of air quality data on public domain. The city will be further assessed on its additional pollutants monitoring, its reduction strategies, its implementation and compliance to the National Standards.

Unit: according to National Ambient Air Quality Standards by CPCB **Maximum Score:** 100

Formula: NA

Performance Evaluation Levels:

	1	2	3	4	5
Progression Levels	**No Consideration**	**Basic Monitoring and Publishing of Data**	**Advanced Monitoring**	**Compliance to NCAP Targets**	**Compliance with National Standards**
Evidence/ Data Sources		• Capture present levels of - PM10 PM2.5, NOx, SOx (as per Central Pollution Control Board Guidelines) and data availability in public domain (Daily records of last 3 months)	• Additional pollutants monitored like CO, VOC and O3 etc as per NAAQS	• Reduction trend / incremental improvement in compliance to National Clean Air Programme, NCAP target (base year 2017) in case of non-attainment cities/ other cities	• Achieve National Ambient Air Quality Standards
Reference Document	National Clean Air Programme (MoEF&CC; 2019) http://cerca.iitd.ac.in/files/reports/NCAP%20Report%20Full.pdf				
Responsible Agency/ Department		CPCB, ULB, SPCB, SPV			
Score	0	25	50	75	100

WATER RESOURCE MANAGEMENT

Indicator 1: Water Resources Assessment and Management

Rationale: Climate change is expected to impact the water resources and subsequently the water availability. It is therefore, important to take stock of the water availability and demand equation in context of climate change so that adequate action can be taken if required.

Description: This indicator is to assess whether the City is on course to meet the future water demand. The indicator requires an assessment of both current and future water availability; and corresponding current and future water demand. Given that many cities depend significantly on ground water resources to augment piped water supply, it is expected that both surface and groundwater assessments would have been conducted.

Methodology: The water resource assessment should look at both surface and groundwater, wherever required, and quantify both availability and demand using scientific techniques. Various sectors for water allocation are domestic, Industrial and agriculture. The city preparing a new water resource management plan shall include the climate change aspects.

Maximum Score: 100 **Formula:** NA **Unit:** NA

Performance Evaluation Levels:

	1	2	3	4	5
Status of water resources assessment and management in the city	**City has not conducted a water resource assessment**	**City has taken stock of existing water resources, its uses for various sectors; projected future water demand and water availability for at least five years using reference standards and other formulae**	**Water Resource Management (WRM) Plan is prepared with Short, Medium- and Long-Term Actions**	**City is on target to meet the future water demand (2035-2040)**	**City has considered climate change scenarios in estimating future water availability**
Evidence/Data Sources	• No assessment is carried out	• A Report/study /plan that indicates stock of existing water resources and its uses for various sectors with projections. The Report/study/plan shall include: i. Main water resource of the city including ground water / surface water ii. Quantum of water available at source iii Details of water allocation for domestic, industry and agriculture purposes iv.Comparison of available water (now) and future water demand for all purposes	• A Report/study/ plan that estimates future water availability. The Report/study/plan shall include: i. Augmentation of existing water resource through reuse, recharge, rejuvenation and storage ii.Reduction of losses iii.Best utilization of water resources by using demand side management.	• Water Resource Management Plan; covering resources such as ground water, surface water and rainwater is implemented • Work Orders issued/ Utilization Certificates for executed works specified in the water resource management plan • A Report/ study reviewing the actions taken as part of the Water Resources Management Plan indicating that the city is on target to meet the future water demand	• The city has reviewed and revised the Water resource Management Plan to include climate change factors. The Report/study/plan shall include: i. Climate change factors such as trend in last 30 years temperature and precipitation that is impacting the water resource ii. Major issues arising because of climate change factors in the city iii.Adaptation and Mitigation actions identified, implementation strategies adopted, and actions initiated
Responsible Agency/ Department	ULB/ Water Utility/ Water Boards/ Flood and Irrigation Department/ Any SPV and or any other relevant implementation agency.				
Reference	Technical Material for Water Resources Assessment, World Meteorological Organization (2012) http://www.wmo.int/pages/prog/hwrp/publications/Technical_report_series/1095_en_4_Web.pdf Strengthening Water Security in Asia and the Pacific, Asian Water Development Outlook, ADB (2016) https://www.adb.org/sites/default/files/publication/189411/awdo-2016.pdf				
Score	0	25	50	75	100

Indicator 2: Extent of Non-Revenue Water

Rationale: Reducing Non-Revenue Water (NRW) is a powerful demand management instrument, which decreases the stress on existing water resources. Given that climate change is expected to create an additional pressure on the existing water resources, reducing NRW is considered as a robust climate smart solution. Reduction in NRW will enhance resilience by reducing both the water losses as well as demand for electricity required for pumping, thereby mitigating GHG emissions.

Description: This indicator highlights the extent of water produced which does not earn the utility any revenue. Non-revenue water is the difference between the volume of water put into a water distribution system and the volume that is billed to customers. NRW comprises - a) Consumption which is authorized but not billed, such as public stand posts; b) Apparent losses such as illegal water connections, water theft and metering inaccuracies; c) Real losses which are leakages in the transmission and distribution networks. Benefits of NRW reduction, in particular of leakage reduction, include:

- Financial gains from increased water sales or reduced water production, including possibly the delay of costly capacity expansion;
- Increased knowledge about the distribution system;
- Increased firefighting capability due to increased pressure;
- Reduced risk of contamination.
- More stabilized water pressure throughout the system

Methodology: NRW is computed as - Difference between total water produced (ex-treatment plant) and total water sold expressed as a percentage of total water produced.

Formula:

$$\left\{ \frac{\textit{Total water produced and put into the transmission and distribution system- Total water sold}}{\textit{Total water produced and put into the transmission and distribution system}} \right\} \textit{ x 100}$$

Unit: Percentage (%)

Maximum Score: 100

Performance Evaluation Levels:

	1	2	3	4	5
NRW reduction	NRW study is not conducted by city	NRW study is conducted by the city considering each distribution network. If yes; city shall provide the most recent reported NRW during 2016-19. Most recent NRW reported by the c ity during 2016-19 is >40% to 50%	Most recent NRW reported by the city during 2016-19 is > 30% to 40%	Most recent NRW reported by the city during 2016-19 is > 20% to 30%	Most recent NRW reported by the city during 2016-19 is < 20%
Evidence/Data Sources	No Study is conducted	Non-Revenue Water (NRW) report			
Responsible Agency/ Department		ULB/ Water Utility/ Water Boards/ Flood and Irrigation Department/ Any SPV and or any other relevant implementation agency.			
Reference	Designing an Effective Leakage Reduction and Management Program (WSP; 2008) http://documents.worldbank.org/curated/en/479201468316169165/pdf/441260WSP0BOX31e0reduction 01PUBLIC1.pdf The Issues and Challenges of Reducing Non-Revenue Water (ADB; 2010) https://www.adb.org/sites/default/files/publication/27473/reducing-nonrevenue-water.pdf				
Score	0	25	50	75	100

Reference

Designing an Effective Leakage Reduction and Management Program (WSP; 2008) http://documents.worldbank.org/curated/en/479201468316169165/pdf/441260WSP0BOX31e0reduction 01PUBLIC1.pdf

The Issues and Challenges of Reducing Non-Revenue Water (ADB; 2010) https://www.adb.org/sites/default/files/publication/27473/reducing-nonrevenue-water.pdf

Indicator 3: Flood risk assessment and management

Rationale: With increased urbanization and high densities, cities are inherently vulnerable to flooding events. Climate change will only intensify the problem. A flood risk assessment is the first step in developing robust flood management strategies and plans.

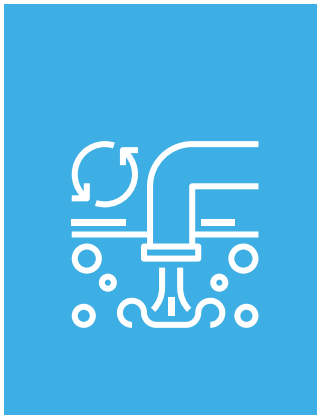
Description: Urban flood is defined as 'the submergence of usually dry area by a large amount of water that comes from sudden excessive rainfall, an overflowing river or lake, melting snow or an exceptionally high tide'. This indicator assesses the preparedness of the city to address the flooding risk.

Methodology: There are generally two types of flood risk assessment. First is a rapid flood risk assessment that uses simple techniques to determine the likely impacts of a flooding event. Second is comprehensive flood risk assessment that is expressed as a function of vulnerability and hazard.

Maximum Score: 100

Performance Evaluation Levels:

	1	2	3	4	5
Status of flood risk in the city and how it is being addressed (if there is a risk)?	**City has not carried out any flood risk assessment**	**City has conducted a rapid flood risk assessment using simple techniques to ascertain flood levels, flooding hotspots, threats to life and property, etc.**	**If there is a flood risk, the city had prepared a plan to address the risk. The plan presents tangible strategies of how the risk will be the mitigated.**	**The city is implementing the flood management plan**	**City has conducted an scientific hazard risk vulnerability assessment (HRVA) and have included recommendations in the relevant plans**
Evidence /Data Sources	No assessment is carried out	Rapid flood risk assessment report shall include: i. Reasons of flooding ii. Flooding Hotspots in city iii.Flood Levels and frequency iv.Threat to Life and Property due to flooding	Flood management plans; drainage master plan/ stormwater management plan. shall include structural and non -structural strategies and shall focus on: i.Reducing the risk of flooding to people and property, quality, diversity, and connectivity of riparian, wetland, floodplain, and revering aquatic habitats where appropriate. ii.Providing a level of protection to urban areas at least equal to last versed flood accrued in the city or a 1 percent chance (1 in 100-year event) of occurrence in any one year. iii.The proposed flood management solutions would need to consider the fluvial geomorphologic characteristics of the Main River and tributaries passing within or nearby city iv.A rapid morphological analysis and report would form the basis for preliminary identification of alternate solutions which shall be within any treated/agreement with in the states or region if applicable.	Work Orders issued/ Utilization Certificates for executed works specified in the flood management plan	
Responsible Agency/ Department		ULB/ Water Utility/ Water Boards/ Flood and Irrigation Department/ Any SPV and or any other relevant implementation agencyReference: MoHUA SOP on Urban Flooding 2017 to be linked; NDMA Guidelines Stormwater manual of CPHEEO			
References		Management of Floods, National Disaster Management Guidelines (NDMA; 2008) https://ndma.gov.in/images/guidelines/flood.pdf Flood Risk Management, A Strategic Approach (Asian Development Bank, GIWP, UNESCO, and WWF-UK; 2013) https://www.adb.org/sites/default/files/publication/30246/flood-risk-management.pdf			
Score	0	25	50	75	100



Indicator 4: Wastewater Recycle and Reuse

Rationale: Recycling and reuse of wastewater reduces the stress on the existing water resources, which are expected to be impacted by climate change.

Description: The percentage of wastewater received at the treatment plant that is recycled or reused after appropriate treatment for various purposes. This should only consider water that is directly conveyed for recycling or reuse, such as use in gardens and parks, use for irrigation, etc. Water that is discharged into water bodies, which is subsequently used for a variety of purposes, should not be included in this quantum. Reuse may be in diverse avenues such as non-potable domestic use; horticulture, agricultural, power plants, industries among others.

The indicator emphasises to reduce the consumption/utilization of clear water.

Methodology: This indicator highlights what percentage of the wastewater generated is being recycled and reused. It is important that the wastewater treatment meets the approved CPCB standards.

Formula:

$$\left\{ \frac{\textit{Treated wastewater recycled and reused in Million litres per day (or) month}}{\textit{(0.80* water supplied to the city in Million litres per day (or) month)}} \right\} \times 100$$

Unit: Percentage(%) **Maximum Score:** 100

Performance Evaluation Levels:

	0	1	2	3	4
Percentage of wastewater reuse	**No reuse**	**< 5% Treated wastewater recycled and reused**	**5 to < 10%Treated wastewater recycled and reused**	**10 to < 20% Treated wastewater recycled and reused**	**> 20% Treated wastewater recycled and reused**
Evidence/ Data Sources	• Water supply records for last six months • Records for secondary/tertiary reuse for last six months				
Responsible Agency/ Department	ULB/ Water Utility/ Water Boards/ Flood and Irrigation Department/ Any SPV and or any other relevant implementation agency				
Responsible Agency/ Department	Handbook of Service Level Benchmarking (CPHEEO; 2008) http://cpheeo.gov.in/upload/uploadfiles/files/Handbook.pdf Chapter 7: Part A: Engineering, Recycling and Reuse of Sewage, Manual on Sewerage and Sewage Treatment Systems (CPHEEO; 2013) http://cpheeo.gov.in/upload/uploadfiles/files/engineering_chapter7.pdf				
Score	0	25	50	75	100

Indicator 5: Energy-efficient wastewater management system in the city

Rationale: Energy-efficient equipment for wastewater pumping in the city leads to reduction in Green House Gas emissions (CO_2 emissions) per KwH of electricity consumed, thereby contributing to climate change mitigation.

Description: Waste Water Management System is defined here as the collection of waste water from the stakeholders of the city and its treatment. Reuse system is not be considered in this analysis and or assessment. There are number of equipment that use energy in a wastewater management system. However, wastewater pumps account for the maximum usage of energy. There are different methods, type of pumps/equipment and solutions that can reduce the use of energy in entire waste water management system. Energy Audit "An energy audit is an assessment and analysis of energy flows in a process or system, aimed at reducing the amount of energy input into the system without negatively affecting the output(s). The main objective is to explore various possibilities for energy conservation. An energy audit requires a thorough and detailed study of every aspect of the system, through the performance of various tests and measurement. Steps in energy audit report are:

- Collect and analyse historical energy usage.
- Study pumping systems and their operational characteristics.
- Identify potential modification that will reduce the energy usage and or cost
- Perform an engineering and economic analysis of potential modifications.
- Prepare a rank-ordered list of appropriate modifications

These are considered here to be a representative of energy efficient waste water management system.

Methodology: This indicator aims to quantify the use and reduction of energy (per MLD of waste water generation and treatment) by using different options and solution used/implemented by the city.

Formula: Nil **Unit:** Percentage(%) **Maximum Score:** 100

Performance Evaluation Levels:

	1	2	3	4	5
Criteria	City has conducted the Energy Audit including for pumping stations and treatment plants.? If yes; city shall provide the most recent report of Energy A udit during 2016-19	Most recent energy reduction reported per MLD by the city during 2016-19 is >5% to 10%	Most recent energy reduction reported per MLD by the city during 2016-19 is >10% to 15%	Most recent energy reduction reported per MLD by the city during 2016-19 is >15% to 20%	Most recent energy reduction reported per MLD by the city during 2016-19 is >20% to 25%
Evidence/ Data Sources	Energy Audit Report				
Responsible Agency/ Department	ULB/ Water Utility/ Water Boards/ Flood and Irrigation Department/ Any SPV and or any other relevant implementation agency				
References	Manual for the Development of Municipal Energy Efficiency Projects. BEE (2008) https://beeindia.gov.in/sites/default/files/ctools/ManualfortheDevelopmentofMunicipalEnergyEfficiencyProjects.pdf A Primer on Energy Efficiency for Municipal Water and Wastewater Utilities (ESMAP; 2012) http://documents.worldbank.org/curated/en/256321468331014545/pdf/682800ESMAP0WP0WWU0TR0010120Resized.pdf				
Score	0	25	50	75	100

Indicator 6: Energy-efficient water supply system in the city

Rationale: Energy-efficient equipment for water supply in the city leads to reduction in Green House Gas emissions (CO_2 emissions) per KwH of electricity consumed, thereby contributing to climate change mitigation.

Description: : Water Supply System is defined here as the water collected from the source, treated, stored and supplied to the end user i.e. entire chain from source to the user. There are number of equipment that use energy in a water supply system. However, water supply pumps account for the maximum usage of energy. There are different methods, type of pumps/equipment and solutions that can reduce the use of energy in entire water supply.

Energy Audit "An energy audit is an assessment and analysis of energy flows in a process or system, aimed at reducing the amount of energy input into the system without negatively affecting the output(s). The main objective is to explore various possibilities for energy conservation. An energy audit requires a thorough and detailed study of every aspect of the system, through the performance of various tests and measurement. Steps in energy audit report are:

- Collect and analyse historical energy usage.
- Study pumping systems and their operational characteristics.
- Identify potential modification that will reduce the energy usage and or cost
- Perform an engineering and economic analysis of potential modifications
- Prepare a rank-ordered list of appropriate modifications.

These are considered here to be a representative of energy efficient water supply.

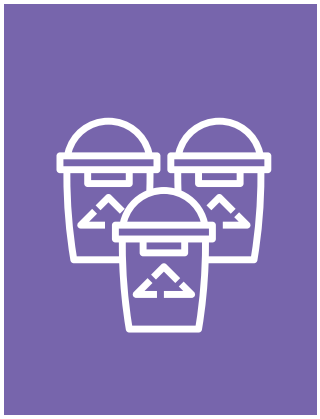
Methodology: This indicator aims to quantify the use and reduction of energy (per MLD of water supplied to the city) by using different options and solution used/implemented by the city.

Formula: *(Trend of reduction in energy consumtion per MLD)* **Unit:** Percentage(%) **Maximum Score:** 100

Performance Evaluation Levels:

	1	2	3	4	5
Criteria	**City has not conducted the Energy Audit including for pumping stations and treatment plants.? If yes; city shall provide the most recent report of Energy Audit during 2016-19**	**Most recent energy reduction reported per MLD by the city during 2016-19 is >5% to 10%**	**Most recent energy reduction reported per MLD by the city during 2016-19 is >10% to 15%**	**Most recent energy reduction reported per MLD by the city during 2016-19 is >15% to 20%**	**Most recent energy reduction reported per MLD by the city during 2016-19 is >20% to 25%**
Evidence/ Data Sources	Energy Audit Report				
Responsible Agency/ Department	ULB/ Water Utility				
References	Manual for the Development of Municipal Energy Efficiency Projects. BEE (2008) https://beeindia.gov.in/sites/default/files/ctools/ManualfortheDevelopmentofMunicipalEnergyEfficiencyProjects.pdf A Primer on Energy Efficiency for Municipal Water and Wastewater Utilities (ESMAP; 2012) http://documents.worldbank.org/curated/en/256321468331014545/pdf/682800ESMAP0WP0WWU0TR0010120Resized.pdf				
Score	0	25	50	75	100

INTEGRATED SOLID WASTE MANAGEMENT



Indicator 1: City demonstrates reduction of solid waste generation in last 5 years

Rationale: The relationship between solid waste and Greenhouse Gases (GHG) emission is well established. GHGs can be avoided though scientific management of waste. The first principle of the Integrated waste management hierarchy is reduction of waste at source. The intent of this indicator is to encourage cities to take actions in order to manage problems associated with increased waste generation. As generation and consumption patterns of waste vary across cities, all Cities are encouraged to conduct regular waste audit programmes for assessing their generation/consumption patterns and characteristics and evolve city specific actions to reduce increasing loads to the existing SWM infrastructure. To begin with, the assessment of waste reduction may be focussed only on quantity of waste disposed off at the landfills and assess the reduction in quantities of waste that were going to landfill in 2015-16 vis-à-vis 2019-20. This will take care of the efforts made by the citizens on one hand in reducing generation of waste at source and efforts by the Municipal Authorities in promoting decentralized & centralized processing of waste and setting up MRF facilities for salvaging recyclable & combustible waste. All these efforts will ultimately result in less quantity of waste going to landfill. (This result will not necessarily prove that per capita waste generation has reduced. It will only prove the reduction in per capita waste disposal. This waste reduction can be assessed by collecting the information as mentioned in the tables below. If we go for assessing reduction in per capita waste generation, it will require a much larger exercise to make it comparable among the cities which we may avoid at this stage.)

Description: "Increase in waste generation with urbanisation" is an accepted phenomenon and in case of Smart Cities; with increasing economic-ability and liveability aspects, this increase is expected to be more as compare to the other urban centres of the country. Therefore, it is important that Smart Cities prioritise certain actions for waste reduction and accordingly plan their future waste management operations and infrastructure requirements. Waste reduction activities are very open–ended and very difficult to assess comprehensively. Though the feasibility of waste reduction is in the entire life cycle of a product; this indicator is assessed on the municipal and citizen centric approaches adopted for waste reduction at source. Municipal authorities are encouraged to evolve and adopt such approaches and with implementation of waste reduction-oriented actions. These actions may be aligned to the National policies and programmes. The indicator highlights the importance of such interventions to halt or demonstrate decline in the increasing rate of waste generation per-capita through identified methods and incentives to reduce the waste generation at source.

Methodology: This indicator assesses the reduction in waste generation on per capita basis. Cities are score based on the percentile method. The cities are requested to share their current and five year earlier records of total waste quantity per day (TPD) and total population of that particular year.

Formula (integrated in the portal): *Increase/ decrease in per capita waste disposal = B*- A***

**B= Per capita solid waste disposal in 2015-16*

***A- Per capita solid waste disposal in 2019-20*

Information requested for assessment:

	Population	Total Solid Waste generated / collected (Average TPD)
2015-16		
2019-20		

Further information will be required for accurate assessment:

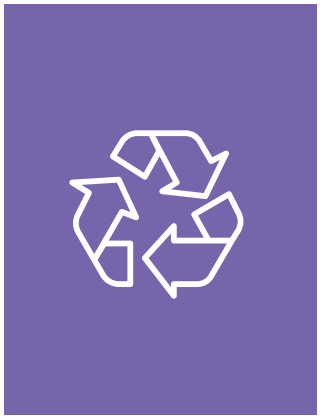
	Total (Monthly average solid waste generated / collected) (Tonnes per month)	Processing (Compost/ W2E/ Biomethanizaton RDF) (Total Tonnes per month)	MRF/ Recycling (formal and/or informal) (Tonnes per month)	Dumpsite/ Landfill (Tonnes per month)
2015-16				
2019-20				

Unit: Annual Average of tonnes per day (for waste quantity) and total population (in figures) in respective years

Maximum Score: 100

Performance Evaluation Levels:

	0	1	2	3	4
Reduction in Per capita waste generation	No reduction	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Evidence/ Data Sources	• For waste quantity- Primary waste quantification data, secondary data (DPR. CDP, DDP, feasibility report, study/ survey report conducted by educational institutes/ Universities/Technical Organisations pertaining to 2015 or before and in 2018 or 2019. • Population from decadal census data and/ or population data projected, as per the guideline of prescribed in CPHEEO, MoHUA, GOI.				
Reference Documents	Chapter 2: Technical Aspects: Segregation, Collection and Transportation, Manual on Municipal Solid Waste Management, 2016, CPHEEO http://cpheeo.gov.in/upload/uploadfiles/files/Part2.pdf				
Responsible Agencies	ULB/ Studies				
Score	0	25	50	75	100



Indicator 2: Extent of recyclables recovered, and Segregated Combustible Fractions (SCF)/ Refused Derived Fuel (RDF) Utilised

Rationale: This indicator highlights the city's commitment towards circular economy and adherence to Integrated Solid Waste Management principles. The indicator intends that Material Recovery Facilities (MRF) with provision for sorting recyclables and facility for producing SCF/RDF are available and operational in cities as per SWM Rules, 2016. The indicator addresses the GHGs mitigation aspects due to resource efficiency.

Description: Reuse and Recycle are the next levels of waste management hierarchy after Reduce and cumulatively known as 3R's. This indicator envisage that Smart Cities take scientific and formalised actions for resource recovery and promotes waste recycling. Waste recovery and recycling systems are yet to be 100% formalised by all Smart Cities authorities and in most of the cities the informal sector takes care of the resource recovery from SWM value chain and its recycling operations. The indictor promotes integration of the informal system and encourages scientific recycling of resources recovered. For example, in an environmental point of view, the city efforts on SCF/RDF production are wasted if/ SCF/RDF derived from municipal waste is utilised in brick kilns with no pollution control instead of a cement kiln or stacked on-site without a clear utilisation plan.

Methodology: The indicator assesses the efficiency of city's waste management systems under two aspects. (i) extent of recyclables recovered from the total city waste and further processed by authorised recycling industries/units. (ii) utilization of non- recyclable inorganic waste having Calorific Value more than 1500 Kcal/kg in the form of SCF/RDF sent to cement kiln or any industry authorised by CPCB as per the Guidelines on Utilisation of Refused Derived Fuel in Various Industries, 2018.

Formula:

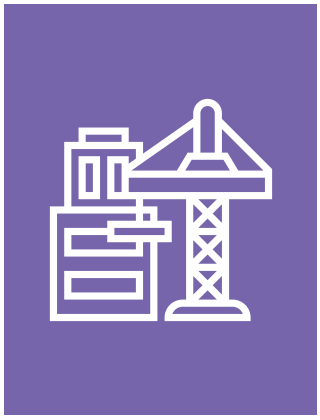
$$\left\{ \frac{\textit{Waste recovered and recycled (TPA)} + \textit{SCF/RDF utilised (TPA)}}{\textit{Total Waste generated (TPA)}} \right\} \textit{x 100}$$

Unit: Percentage(%) **Maximum Score:** 25

Performance Evaluation Levels:

	0	1	2	3	4
Criteria	No Facility exists	Material recovery with provision for sorting recyclables exists and facility for producing SCF/ RDF exists (in same premises or separate unit)	*Up to 10% of total annual city waste generated is sold to approved / authorised collectors or/and sent to SPCB authorised recycler/ recycling facility and SCF/RDF is sent to cement Kilns /Waste to Energy Plants	*10-20% of total annual city waste generated is sold to approved /authorised collectors or/and sent to SPCB authorised recycler/recycling facility and SCF/RDF is sent to cement Kilns / Waste to Energy Plants	*>20% of total annual city waste generated is sold to approved / authorised collectors or/ and sent to SPCB authorised recycler/recycling facility and SCF/RDF is sent to cement Kilns / Waste to Energy Plants
Evidence/ Data Sources		• MRF exists (centralised or Decentralised facility) for paper/board/plastic/glass/metal) • SCF/RDF facility (for high calorific value, non-recyclable, non-biodegradable waste) – exists	• Waste Quantification and characterisation study report within last three years • Sale receipts/records of recyclables to authorised recycling (Monthly records of last 12 months) • Sale receipt/records of SCF, RDF (Monthly records of last 12 months) • SPCB authorisation for all Recycling Facilities to whom Recyclables and SCF/RDF is sold		
Reference Material	Guidelines on Usage of Refuse Derived Fuel in Various Industries. CPHEEO 2018 http://cpheeo.gov.in/upload/5bda791e5afb3SBMRDFBook.pdf Materials Recovery Facility ToolKit, ADB 2013 https://www.adb.org/sites/default/files/publication/30220/materials-recovery-facility-tool-kit.pdf				
Responsible Agency/ Department	ULB/ MRF Operator Agency/ Formal or Informal Recyclers				
Score	0	25	50	75	100

* In cases where waste generators give away recyclables from source to ragpickers / recyclers as per Rule 4 (1a) of SWM Rules, 2016 that need to be appreciated and accounted for while determining the percentage of recyclables recovered. This percentage could be ascertained from waste quantification & characterisation studies or any other study underataken by the city – e.g. in Kerala State where decentralized system is promoted, 39.54% recyclables are reportedly given away to recylers from the doorstep which accounts for roughly 8% of the total waste and only 2.64% waste is handled by large number of MRFs setup by the city in the urban areas.



Indicator 3: Recycled Aggregates (RA) and Recycled Concrete Aggregates (RCA) derived from City Construction and Demolition (C&D) waste are utilised.

Rationale: The indicator addresses the Greenhouse Gases (GHG) mitigation aspects due to Construction and Demolition Waste recycling and utilisation. The indicator intends that C&D Waste Management facilities are available and operational in cities as per C&D Waste Management Rules, 2016

Description: The Construction and Demolition (C&D) waste is a major component of all the waste generated by the construction boom. To reduce the pressure on the exploitation of natural resources, cities need to focus on finding greener ways to produce concrete, encouraging the reuse of recycled materials to replace virgin materials. Scientific evidence exists about reduction of GHG by reuse of recycled materials. "ClimateSmart Cities" encourages scientific processing of C&D waste as per Rules and BIS Standard IS 383. 100% utilisation of Recycled Aggregates (RA) and Recycled Concrete Aggregates (RCA) can be achieved through State/city level policies.

Methodology: This indicator assesses the extent of decentralized and centralized management of C&D waste generated. The indicator also assesses the extent of utilization of recycled C&D waste in a city. The total C&D waste generated in the city would be as declared in the latest Swachh Survekshan.

Formula: *The total C&D waste generated in the city would be as declared in the latest Swachh Survekshan*

$$* \left\{ \frac{\text{Total C\&D Waste Transferred to Processing Facility or designated dumping point}}{\text{Total C\&D Waste Generated in City}} \times 100 \right\} \quad \text{expressed as percentage}$$

$$** \left\{ \frac{\text{Total C\&D Waste transferred to Processing Facility which is converted to Recycled Products}}{\text{Total C\&D Waste Transferred to rocessing Facility}} \times 100 \right\} \quad \text{expressed as percentage}$$

Unit: Percentage(%) **Maximum Score:** 100

Performance Evaluation Levels:

	0	1	2	3	4
Criteria/ Sub-indicators/ Progression Levels	**Formal System for C&D Waste Management Exists**	**Dedicated storage and Collection Mechanism for C&D Waste exists**	**Dedicated Transport and Disposal Mechanism for C&D Waste exists**	**Processing of C&D Waste**	**Reuse of Recycled Waste**
Evidence/ Data Sources	No formal system for C&D Waste Management Exists	• Notification of User Charges • Notification of notified dumping points (Primary & Secondary bins) • Private agency/ ULB department assigned (contract copy) • Helpline no. exists	• Private agency/ ULB department assigned for transport (contract copy) • Data Records/Log books • Vehicle list delicately assigned for transportation • >70 % of city C&D waste generated is sent for processing facility (ULB owned or tie up with any other agency/ city) or dumped in designated point authorised by ULB*	• Processing Facility Exists or tie up with C&D waste processing facility (contract copy) • Log books of waste Processing for the last three months • >50 % of city C&D waste reaching processing Facility is recycled**	• City mandate on using recycled products (document) • 100 % of city recycled C&D waste is reused- Sale record /receipts of last three months
Reference Material	Utilisation of Recycled Produce of Construction & Demolition Waste, Building Materials and Technology Promotion Council, MoHUA, 2018 http://164.100.228.143:8080/sbm/content/writereaddata/C&D%20Waste_Ready_Reckoner_BMTPC_SBM.pdf Guidelines on Environmental Management of Construction & Demolition Waste, CPCB, 2017 https://kspcb.gov.in/Guidelines_C_and_D_waste.pdf				
Responsible Agency/ Department		ULB/ Private Agency	ULB/ Private Agency	Private Agency	ULB/ Private Agency
Score	0	25	50	75	100

Indicator 4: Greenhouse Gases (GHGs) emission reduced due to improved Municipal Waste processing and treatment facilities

Rationale: The Greenhouse Gases (GHG) emission can be avoided with scientifically operated and managed waste processing facilities in cities as per Solid Waste Management Rules, 2016

Description: This indicator assesses the avoided GHG emissions, as a result of waste processing in the city. The performance evaluation levels table does not objectively reflect the type of landfill / dumpsite used in the city and characterization of waste generated in the city. There should be a connect between the data collected and marks alloted in the evaluation table, which seems to be missing.

Methodology: GHG emissions avoided will be calculated as per the Methane Commitment Model provided in the Global Protocol for Community Scale GHG Emissions (GPC, V2.0). The Methane Commitment method takes a mass-balance approach. It calculates landfill emissions based on the amount of waste disposed in a given year, regardless of when the emissions actually occur (a portion of emissions are released every year after the waste is disposed). GHG emissions reduction will be calculated by the evaluation team, based on the following information provided by the city:

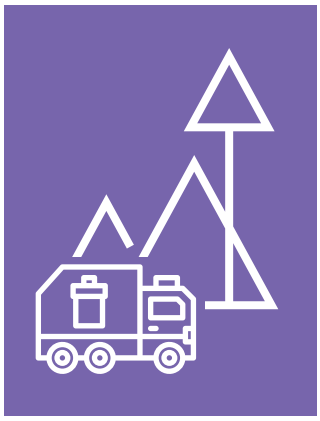
- Total amount of waste generated in the city
- Quantum of Waste treated through Biological processes like composting, bio-methanisation
- Quantum of Waste treated through incineration processes like waste to energy
- Total waste recycled and recovered
- Total quantum of MSW sent to landfill/dumpsite in inventory year
- Total amount of waste processed (Compost, RDF/SCF/ Bio-methanisation, Waste to Energy in Centralised/ decentralised model)
- Type of landfill/dumpsite that is used in your city:
    - > Anaerobic managed solid waste disposal sites: These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following:
      (i) cover material; (ii) mechanical compacting; or (iii) levelling of the waste.
    - > Semi-aerobic managed solid waste disposal sites: These must have controlled placement of waste and will include all of the following structures for introducing air to waste layer: (i) permeable cover material; (ii) leachate drainage system; (iii) regulating pondage; and (iv) gas ventilation system.
    - > Unmanaged solid waste disposal sites – deep and/or with high water table: All SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 metres and/or high-water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste.
    - > Unmanaged shallow solid waste disposal sites; All SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres.
- Characterization of waste generated in your city (%):
    - > Paper/cardboard
    - > Textiles
    - > Food waste
    - > Wood
    - > Garden/Park waste
    - > Nappies/Sanitary waste
    - > Rubber and Leather
    - > Average annual rainfall in your city

Formula: *Based on the above information the formula given below will be used by the evaluation team to calculate GHG emissions avoided as a result of processing:*

Unit: Percentage(%) **Maximum Score:** 100

Performance Evaluation Levels:

	0	1	2	3	4
Percentage of GHG emission avoided because of city's processing facilities	**No reduction**	**≤25%**	**25 to ≤50%**	**50 to ≤75%**	**>75%**
Evidence/ Data Sources	• Consent to Establish and Operate for all processing facilities based on various technological options followed either/or centralised or decentralised waste management principles i.e. Composting, RDF, Waste to Energy, Bio-methanisation . • Consent to operate sanitary land-fill site • Log book data (type of vehicles, number of trips and capacity of all kinds of operational vehicles) involved into collection of the waste. **For each processing facility (compiled sheet):** • Weigh bridge records of waste sent to processing in all processing facilities for the last 12 months • Records of quantum of product (Compost/ Electricity / bio gas) produced from such processing facilities for the last 12 months • Records of quantum of rejects from each processing facility, that are disposed in the dumpsite/sanitary landfill • Waste Characteristics as in Methodology				
Reference Material	The Climate Change Mitigation Potential of the Waste Sector, German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, 2015 https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte_56_2015_the_climate_change_mitigation_potential_of_the_waste_sector.pdf				
Responsible Agency/ Department	ULB/ Processing Facility Operator				
Score	0	25	50	75	100



Indicator 5: Scientific Landfill is available with city as per SWM Rules, 2016

Rationale: The Greenhouse Gases (GHG) emission can be avoided if the waste disposal facility is scientifically operated and managed as per Solid Waste Management Rules, 2016

Description: The scientific landfill should conform to the SWM Rules, 2016 and Guidance given in the Municipal Solid Waste Management (MSWM) Manual, 2016 (CPHEEO, 2016) and any other updated criteria published by CPCB/ State PCB for Solid Waste Disposal Facilities.

Methodology: There are certain parameters and conditions suggested in SWM Rules, 2016 and Guidance given in the MSWM Manual, 2016 (CPHEEO, 2016) and Environmental Clearance is provided based on these parameters and conditions as applicable. Environmental Clearance for such facilities is provided by the State Environmental Impact Assessment Authority or as applicable for the state. Furthermore, the landfill operation and management are assessed based on Solid Waste Management Rules, 2016.

Benchmark: Landfill is sited, operated and managed as per the SWM Rules, 2016 and guidance provided under MSWM Manual, 2016

Maximum Score: 100

Performance Evaluation Levels:

	0	2	4
Scientific Landfill is available as per SWM Rules, 2016	No	Yes, and sited as per SWM Rules, 2016	Yes, and under operation as per SWM Rules, 2016
Evidence	Only dumpsite exist	• Environmental Clearance (EC) form SEIAA or as applicable for the State	• Concessionaire agreement of the contractor appointed if on PPP model • Weigh bridge records for waste input, output (product-compost/ electricity) and rejects from processing facility of last 6 months • Weigh bridge records of inert/ waste disposed in the landfill in last 6 months
Reference Material	Municipal Solid Wastes (Management & Handling) Rules, 2016 https://cpcb.nic.in/uploads/MSW/SWM_2016.pdf		
Score	0	5	10

Indicator 6: Plan prepared and implemented for scientific landfill/ dumpsite closure considering GHG emissions

Rationale: The scientific closure and post closure maintenance of engineered landfills and dumpsites avoid significant GHG emissions. Bio-mining of dumped waste and/or making windrows over dumpsites do not mitigate GHG emission and hence have not been considered under this indicator.

Description: Landfill gas (LFG) is a natural by-product of the decomposition of organic material in landfills. LFG is composed of roughly 50 percent methane (the primary component of natural gas), 50 percent carbon dioxide (CO_2) and a small amount of non-methane organic compounds. Methane is a greenhouse gas which has 28 to 36 times more potential than CO_2 for trapping heat in the atmosphere over a 100-year period, hence it is important to mitigate Landfill gases. Methane recovered from landfills can either be flared or used as an energy resource.

Methodology: This indicator assesses the city's readiness to capture and use Landfill gas in its quest to avoid GHG emission.

Benchmark: Gas collected from Landfill is reused or No gas exists in the landfill after use/ Flaring Recovered or/and capped land has been converted into green space for public/ multi-use e.g. for setting up solar parks.

Maximum Score: 100

Performance Evaluation Levels:

	0	1	2	3	4
	No Plan/ report for scientific landfill/ dumpsite closure exists	**Plan/ Detailed project Report for scientific landfill/dumpsite closure along with post closure maintenance exists**	**Scientific capping executed and collected gas is flared/ no gas is available after flaring**	**Scientific capping executed, and gas collected is reused or No gas exists in the landfill after use and scientifically capped area is maintained as per post closure conditions of Environmental Clearance**	**Scientifically capped land has been converted into green space for public/ multi-use after post maintenance period**
Evidence		• Copy of DPR; Concessionaire agreement if Project on PPP Model • Design Layout	• Evidence of the scientific closure and gas flaring- Utilization Certificate for Executed works; certificate from Municipal commissioner /Independent Engineer for executed works through concessionaire if PPP project • Flaring record of gases in last 6 months of Operation	• Evidence of post closure maintenance works; certificate from Municipal commissioner/ Independent Engineer/ for executed works through concessionaire if PPP project Records on the • quantity of gas generation and reused	• Certificate from Municipal Commissioner/ Independent Engineer, if PPP project on landscaping of closed landfill and its access to public
Reference Material	Chapter 4: Technical Aspects: Municipal Sanitary Landfils, Manual on Municipal Solid Waste Management, 2016, CPHEEO http://cpheeo.gov.in/upload/uploadfiles/files/Part2.pdf				
Score	0	25	50	75	100

Ministry of Housing and Urban Affairs
Government of India